Database of Nucleon-Nucleon Scattering Cross Sections by Stochastic Simulation, Phase I

Completed Technology Project (2005 - 2005)

Project Introduction

A database of nucleon-nucleon elastic differential and total cross sections will be generated by stochastic simulation of the quantum Liouville equation in the Wigner representation, incorporating innovations of: (1) antisymmetrization effects of spin ? nucleons in phase space; (2) the first order quantum corrections as a stochastic process for two-nucleon dynamics; and (3) a linked list algorithm to streamline and speed computing. Phase I will produce a prototype 4-dimensional phase space simulation of one dimensional spatial scattering, which will be extended in Phase II to three dimensional spatial scattering with a full 12-dimensional phase space model. Significance includes design of radiation shielding materials for manned NASA missions into deep space, where galactic cosmic rays pose a serious health hazard. Computer codes simulating nuclear transport through materials, with associated input databases of interaction cross sections, enable radiation risk assessment of shielding materials. The proposed database of nucleon cross sections forms a subset of the input database. The simulation may potentially be extended to generate databases for nuclear elastic, inelastic, and fragmentation cross sections. Commercial applications include radiation protection for humans on earth under hazardous conditions. The simulation also has applications to nanotechnology and quantum information technologies.

Primary U.S. Work Locations and Key Partners

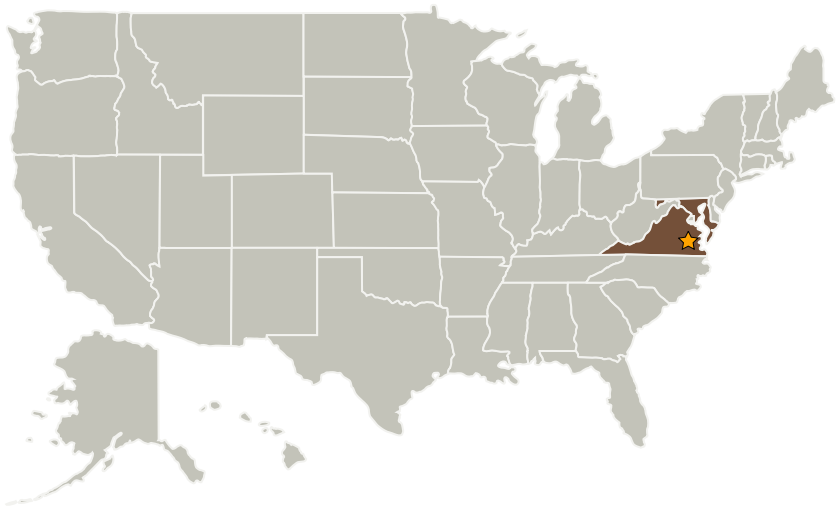

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Table of Contents

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Langley Research Center (LaRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Langley Research Center(LaRC)	Lead Organization	NASA Center	Hampton, Virginia
Eloimagnus Advanced Sciences & Technologies	Supporting Organization	Industry	Bethesda, Maryland

Primary U.S. Work Locations	
Maryland	Virginia

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Sarah John

Technology Areas

Primary:

- TX02 Flight Computing and Avionics
  - TX02.2 Avionics Systems and Subsystems
    - TX02.2.2 Aircraft Avionics Systems